

# Predictors for Probable Posttraumatic Stress Disorder among Outpatients with Psychiatric Disorders and their Caregivers during the COVID-19 Pandemic: A Cross-sectional Study in Taiwan

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## Abstract

**Objective:** The coronavirus disease 2019 (COVID-19) pandemic may have psychological impacts on patients with mental disorders and their caregivers. In this study, we intended to explore whether female, previous trauma, lack of social support, additional life stress, and nonpsychotic symptoms, can predict to develop probable posttraumatic stress disorder (PTSD) during COVID-19 pandemic among outpatients with psychiatric disorders and their caregivers. **Methods:** In this cross-sectional study, we recruited outpatients with psychiatric disorders and their caregivers and collected their sociodemographic variables and levels of PTSD-related symptoms with a copy of self-reported questionnaire. Potential predictors associated with the levels of probable PTSD were identified using simple linear regression analyses. We used logistical regression analysis and multiple linear regression analyses to identify those variables for the independent predictors. Due to the nonnormality of distribution, we used simple and logistic linear regression analyses with 1,000 bootstrap samples to verify the results. **Results:** We analyzed the study data of 145 participants. Logistic regression analysis showed that activity (odds ratio [OR] [95% confidence interval (CI)] = 1.409 [0.178–3.711],  $p < 0.01$ ) and panic symptoms (OR [95% CI] = 20.778 [18.509–23.638],  $p < 0.01$ ) were significant predictors of developing probable PTSD. Multiple regression analyses showed that individuals with higher education ( $\beta = 0.210$ ,  $p < 0.05$ ) and stressor ( $\beta = 0.233$ ,  $p < 0.05$ ) were significantly associated with higher level of probable PTSD symptoms in the nonprobable PTSD group. Individuals with more chronic physical illness ( $\beta = 0.512$ ,  $p < 0.05$ ) were associated with significantly higher level of probable PTSD symptoms. **Conclusion:** In the current study, we identified that activity, panic symptoms, high education, stressors, and more chronic physical illness were predictors either in developing probable PTSD or severe probable PTSD symptoms during the COVID-19 pandemic. Further studies are warranted to extend the application and generalizability of our study results.

**Key words:** disaster-related psychological screening test, hopefulness scale, Pittsburgh Sleep Quality Index, sleep disturbance  
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## Introduction

Coronavirus disease 2019 (COVID-19) has spread worldwide since the end of 2019 and declared a pandemic on March 11, 2020, by the World Health Organization. As of November 23, 2020, 58,570,555 confirmed cases existed and

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1,380,436 deceased in about 187 countries. COVID-19 deeply has affected people's daily lives, including health burden and socioeconomic well-being, as well as has become a biological disaster [1-3]. Taiwan, surprising the world with only 617 confirmed cases and 7 deceased, has successfully prevented a large-scale epidemic outbreak of COVID-19 through big data analytics, new technology, and proactive testing [4]. But general population in Taiwan still suffer from undesirable psychological impacts during the COVID-19 pandemic such as sleep disturbances and suicidal thoughts [5]. Other studies surveyed protective factors against COVID-19-related psychological impact, including subjective mental health and resilience [6, 7]. But a lack of systemic survey exists in identifying predictors of COVID-19-related mental problems.

Patients with mental disorders suffer from an increased risk of infectious diseases [8], poorer tolerability to stress compared with the general population, worsening mental problems [9], and difficulties to receive timely treatment for COVID-19 [10]. A previous study recruiting patients with schizophrenia in the isolation ward for COVID-19 has reported higher levels of depression and poorer sleep quality compared to patients without isolation [11]. Patients with depressive and bipolar disorders have heightened psychological distress and adverse changes to lifestyle behaviors compared to healthy control groups during the COVID-19 pandemic in Australia [12]. Infection risk from visiting the hospital, free-floating anxiety, and rumination about the outbreak may worsen their preexisting disease [3]. The psychological impacts of COVID-19 among patients with mental disorders have been preliminary identified. But the impacts of COVID-19 on posttraumatic stress disorder (PTSD), a major concern with regard to the psychological impact of disasters, have not been explored in patients with mental disorders and their caregivers. Caregivers of patients with mental illness are at risk of mood disorders for concerns related to future, difficulty coping with problematic behaviors, and stigma associated with mental illness [13-16]. Given the enormous impact on psychological stress caused by COVID-19, examining predictors may help to early detection and intervention among patients with mental disorders and their family during the COVID-19 epidemic. A meta-analysis conducted on 14 separate risk factors for PTSD among civilian and soldiers showed that factors such as gender, age at trauma, and race can predict PTSD in some populations but not in others; but that factors such as education, previous trauma, and general childhood adversity can predict PTSD consistently [17].

In this study, we hypothesized that female, previous trauma, lack of social support, nonpsychotic symptoms, and additional life stressors would be correlated to the incidence or severity of PTSD in outpatients with psychiatric disorders and their caregivers.

## Methods

### Study procedures and subjects

Participants were recruited using printed advertisements at the Kaohsiung Municipal Kai-Syuan Psychiatric Hospital (KSPH) outpatient clinic in Taiwan, from May 9 to 31, 2020. The

inclusion criteria were individuals who could understand the objective of the study and follow the instructions from research assistants. Informed consent was obtained before filling in the questionnaire. This study was approved by the institutional review board of KSPH (protocol number = KSPH-2020-03, and date of approval = May 8, 2020). We also registered this study at ClinicalTrials.gov (identifier number = NCT04389476).

## Measures

### Disaster-related psychological screening test

The self-administered 10-item disaster-related psychological screening test (DRPST) is used to assess the severity of trauma-related problems in the preceding month. Each item is assessed on a two-point scale, with a score ranging from 0 to 3 in major depressive episodes (MDEs) scale and 0–7 in PTSD scale, which has shown good reliability and validity in screen for PTSD after a disaster [18, 19]. A relatively high total score indicates a more severe level of depression or trauma-related problems than a relatively low total score. A previous study has been validated that individuals with scores of 4 or higher on the PTSD scale or scores of 2 or higher on the MDE scale are victims with PTSD or MDEs, respectively [18]. In our study, individuals with a cutoff score of 4 points or more in DRPST were categorized to “probable PTSD” group in our study; other patients with 0–3 points in DRPST were categorized to “non-probable PTSD” group. In this study, the internal reliability (Cronbach's  $\alpha$ ) of MDEs and PTSD scale of DRPST was 0.75 and 0.86, respectively, indicating the value being an acceptable range [20].

### Hopefulness

The level of hopefulness was measured using one questions as “Do you feel pessimistic and uncertain about the future?” and reverse coding using a five-point Likert scale, with scores ranging from 0 (no) to 5 (extremely). Higher scores indicated higher levels of hopefulness in this study.

### Pittsburgh Sleep Quality Index

The self-administered Pittsburgh Sleep Quality Index (PSQI) was initially developed to measure the sleep quality in clinical populations, and PSQI which has been validated with good validity and reliability [21]. Four items selected from the PSQI were used to estimate the level of sleep disturbances difficulty to fall asleep, waking up in the middle of the night, subjective sleep quality, and enthusiasm in the preceding month. Each item is assessed on a four-point scale, with a score ranging from 1 to 4, and a relatively high total score indicates a more severe level of sleep disturbances than that with a relatively low total score. The internal reliability (Cronbach's  $\alpha$ ) of PSQI in the present study was 0.85, indicating the value being an acceptable range [20].

### Statistical analysis

A Chi-square test was used to evaluate category variables, and a *t*-test was used for continuous variables. We used simple linear regression analyses to ascertain whether the independent factors were associated with dependent variables, the cutoff

score (3/4) of DRPST PTSD scale. Furthermore, we used logistic and multiple linear regression analyses to examine the variables in simple linear regression analyses consequently.  $p < 0.05$  was considered significant for all tests. Because nonnormally distributed samples were identified with the significance of the Kolmogorov–Smirnov test ( $p < 0.001$ ) in our samples, logistic and multiple linear regression analyses with 1,000 bootstrap samples were used to verify the results, according a previous study suggestion [22]. In the bootstrapping method, 95% confidence intervals (CIs) were used to determine statistical significance, as those values can qualify the stability of the regression coefficients and reduce the length of the CI [23]. When the 95% CI of a regression coefficient did not contain zero, the variable was significant.

All statistical analyses were done using Statistical Package for the Social Science software, version 20.0 (SPSS Inc., Chicago, Illinois, USA). The differences between the groups were considered significant if  $p$  values were smaller than 0.05.

## Results

Totally 203 individuals participated in this study, and 58 did not complete the copy of the questionnaire. Totally 145

participants (99 females and 46 males) were analyzed. No significant differences in gender and age were found between those who completed the copy of questionnaire and those who did not.

As shown in Table 1, in a comparison of the sociodemographic characteristics, no significant difference existed between non-probable PTSD group and probable PTSD group with regard to gender (female dominantly), age (around 50 years), employed (more than 90%), with spouse (around 60%), religion believes (around 70%), chronic physical illness (30%–40%), tobacco (around 10%), alcohol (around 20%), exercise (around 80%), regular diet (around 90%), previous trauma (around 25%), stressors (around 50%), and anxiety (around 10%). Compared to the non-probable PTSD group, the probable PTSD group was significantly more prevalent in higher education ( $14.2 \pm 3.0$  vs.  $15.9 \pm 2.3$  years,  $p < 0.05$ ), activity (41.8% vs. 69.6%,  $p < 0.05$ ), panic symptoms (0% vs. 4.3%,  $p < 0.05$ ), lower level of hopefulness ( $4.8 \pm 0.5$  vs.  $4.1 \pm 1.1$ ,  $p < 0.001$ ), except higher level of PSQI ( $4.2 \pm 1.6$  vs.  $5.7 \pm 3.4$ ,  $p < 0.001$ ), DRPST-MDEs scale ( $0.1 \pm 0.4$  vs.  $0.6 \pm 1.1$ ,  $p < 0.01$ ), and DRPST-PTSD scale ( $0.5 \pm 0.9$  vs.  $5.6 \pm 1.2$ ,  $p < 0.001$ ).

Table 2 lists the impact of each sociodemographic characteristic factor on the cutoff score of DRPST-PTSD scale

**Table 1.** Comparisons of sociodemographic characteristics and scores of disaster-related psychological screening test posttraumatic, stress disorder scale between nonprobable posttraumatic stress disorder group and probable posttraumatic stress disorder group (N = 145)

Sociodemographic characteristics	Nonprobable PTSD ( $n = 122$ ), $n$ (%)	Probable PTSD ( $n = 23$ ), $n$ (%)
Gender		
Male	40 (32.8)	6 (26.1)
Female	82 (67.2)	17 (73.9)
Age (years), mean $\pm$ SD	$46.7 \pm 16.9$	$50.8 \pm 16.1$
Education (years), mean $\pm$ SD	$14.2 \pm 3.0$	$15.9 \pm 2.3^*$
Employed	113 (92.6)	22 (95.7)
With spouse	66 (54.1)	16 (69.6)
Religious believes	91 (74.6)	17 (73.9)
Chronic physical illness	37 (30.3)	10 (43.5)
Tobacco	13 (10.7)	2 (8.7)
Alcohol	26 (21.3)	4 (17.4)
Exercise	93 (76.2)	20 (87.0)
Activity	51 (41.8)	16 (69.6)*
Regular diet	109 (89.3)	22 (95.7)
Previous trauma	27 (22.1)	8 (34.8)
Stressor	49 (40.2)	13 (56.5)
Anxiety	5 (4.1)	3 (13.0)
Panic	0	1 (4.3)*
Hopefulness, mean $\pm$ SD	$4.8 \pm 0.5$	$4.1 \pm 1.1^{***}$
PSQI, mean $\pm$ SD	$4.2 \pm 1.6$	$5.7 \pm 3.4^{***}$
DRPST-MDEs, mean $\pm$ SD	$0.1 \pm 0.4$	$0.6 \pm 1.1^{**}$
DRPST- PTSD, mean $\pm$ SD	$0.5 \pm 0.9$	$5.6 \pm 1.2^{***}$

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$  using Chi-square test or  $t$ -test for group comparisons when appropriate.

Individuals with a cutoff score of 4 points or more in DRPST were categorized to “probable PTSD” group in our study; other patients with 0-3 points in DRPST were categorized to “nonprobable PTSD” group.

SD, standard deviation; DRPST-MDEs, major depressive episodes scale of disaster-related psychological screening test; DRPST-PTSD, posttraumatic stress disorder scale of disaster-related psychological screening test; PSQI, Pittsburgh Sleep Quality Index

**Table 2.** Predictors for probable posttraumatic stress disorder examined by simple linear and logistic regression analyses in all participants ( $n = 145$ )

Predictors	Simple linear regression, $\beta$	Logistic regression, OR (95% CI)
Gender (female vs. male)	0.053	-0.041 (-1.477 - 1.573)
Age	0.089	-
Education	0.201**	0.162 (-0.093 - 0.457)
Employed	0.044	-
With spouse	0.114	-
Religious believes	-0.006	-
Chronic physical illness	0.103	-
Tobacco	-0.024	-
Alcohol	-0.035	-
Exercise	0.094	-
Activity	0.203*	1.409 (0.178 - 3.711)**
Regular diet	0.078	-
Previous trauma	0.108	-
Stressor	0.121	-
Anxiety	0.143	-
Panic	0.192**	20.778 (18.509 - 23.638)**
Hopefulness	-0.396**	-0.940 (-2.746 - 0.013)
PSQI	0.281*	0.037 (-0.465 - 0.356)
DRPST-MDEs	0.267*	0.578 (-1.209 - 1.698)

\* $p < 0.05$ , \*\* $p < 0.01$ .

Individuals with a cutoff score of 4 points or more in DRPST were categorized to “probable PTSD” group in our study; other patients with 0-3 points in DRPST were categorized to “nonprobable PTSD” group. Coefficients in bold are significant at  $p < 0.05$  (bootstrapped 95% CIs, 1000 repetitions) in simple linear regression and logistic regression (method: Enter) analyses.

CI, confidence interval; OR, odds ratio; DRPST-MDEs, major depressive episodes scale of disaster-related psychological screening test; PTSD, posttraumatic stress disorder; PSQI, Pittsburgh Sleep Quality Index;  $\beta$ , standardized coefficients

in all participants obtained using simple linear and logistic regression analyses. Sociodemographic characteristics showed that a significant impact on the cutoff score of DRPST-PTSD scale in all participants were education ( $\beta = 0.201$ ,  $p < 0.01$ ), activity ( $\beta = 0.203$ ,  $p < 0.05$ ), panic symptoms ( $\beta = 0.192$ ,  $p < 0.01$ ), hopefulness ( $\beta = -0.396$ ,  $p < 0.01$ ), PSQI ( $\beta = 0.281$ ,  $p < 0.05$ ), and DRPST-MDEs ( $\beta = 0.267$ ,  $p < 0.05$ ). Activity (odds ratio [OR] = 1.409, 95% CI = 0.178–3.711,  $p < 0.01$ ) and panic symptoms (OR = 20.778, 95% CI = 18.509–23.638,  $p < 0.01$ ) were significantly correlated with developing probable PTSD. But gender, education, hopefulness, PSQI, and the score of DRPST-MDEs were not associated with probable PTSD in the logistic regression analysis when considering other variables consequently.

Table 3 summarizes the results of sociodemographic characteristic factors on the score of DRPST-PTSD scale in nonprobable PTSD group and probable PTSD group, using simple and multiple regression analyses, respectively. Factors that had a significant impact on the score of DRPST-PTSD scale in nonprobable PTSD were gender ( $\beta = 0.176$ ,  $p = 0.021$ ), education ( $\beta = 0.165$ ,  $p = 0.041$ ), tobacco ( $\beta = -0.154$ ,  $p < 0.01$ ), exercise ( $\beta = 0.194$ ,  $p < 0.01$ ), activity ( $\beta = 0.206$ ,  $p < 0.05$ ), stressors ( $\beta = 0.284$ ,  $p < 0.01$ ), and PSQI ( $\beta = 0.255$ ,  $p < 0.01$ ) in simple regression analyses. We further enter gender, education, tobacco, exercise, activity, stressors, and PSQI as the independent variables; we found a higher score of DRPST-PTSD scale reported by individuals with higher

education ( $\beta = 0.201$ ,  $p < 0.05$ ) and stressors ( $\beta = 0.233$ ,  $p < 0.05$ ) than those not. In the probable PTSD group, the variables which had a significant impact on the score of DRPST-PTSD scale in simple linear regression analyses were with chronic physical illness ( $\beta = 0.568$ ,  $p < 0.05$ ), anxiety symptoms ( $\beta = 0.376$ ,  $p < 0.01$ ), hopefulness ( $\beta = -0.474$ ,  $p < 0.05$ ), and PSQI ( $\beta = 0.527$ ,  $p < 0.01$ ). In the model of probable PTSD group using multiple regression analysis, we included all data with gender, chronic physical illness, anxiety, hopefulness, and PSQI as the independent variables; we found significantly a higher score of DRPST-PTSD scale in individuals with chronic physical illness ( $\beta = 0.512$ ,  $p < 0.05$ ) than those not. The variable values explained using the models of nonprobable PTSD and probable PTSD group were 13.8% and 47.4%, respectively.

## Discussion

This cross-sectional study assessed the impacts of gender, previous trauma, lack of social support, additional life stress, hopefulness, nonpsychotic symptoms, and other factors on developing and the severity of probable PTSD in outpatients with psychiatric disorders and their caregivers during COVID-19 pandemic. In the nonprobable PTSD group, we found more severe PTSD symptoms in individuals with higher education and stressors than those not. Furthermore, we found that individuals with chronic physical illness were significantly associated with higher severity of probable PTSD symptoms.

**Table 3.** Predictors for level of probable posttraumatic stress disorder examined by simple and multiple linear regression analyses ( $n = 145$ )

Predictors	Nonprobable PTSD, $\beta$		Probable PTSD, $\beta$	
	Simple linear regression	Multiple linear regression	Simple linear regression	Multiple linear regression
Gender (female vs. male)	0.176	0.132	0.209	0.230
Age	-0.043	-	0.165	-
Education	0.165*	0.210*	-0.287	-
Employed	-0.143	-	-0.085	-
With spouse	-0.153	-	0.246	-
Religious believes	0.001	-	-0.053	-
Chronic physical illness	0.074	-	0.568*	0.512*
Tobacco	-0.154**	-0.084	0.118	-
Alcohol	0.129	-	-0.026	-
Exercise	0.194**	0.123	-0.035	-
Activity	0.206*	0.187	0.329	-
Regular diet	0.034	-	-0.082	-
Previous trauma	0.182	-	0.360	-
Stressor	0.284**	0.233*	-0.027	-
Anxiety	0.245	-	0.376**	-0.048
Panic	-	-	0.082	-
Hopefulness	-0.209	-	-0.474*	-0.091
PSQI	0.255**	0.158	0.527**	0.409
DRPST-MDEs	0.135	-	0.241	-

\* $p < 0.05$ , \*\* $p < 0.01$ .

Individuals with a cutoff score of 4 points or more in DRPST were categorized to “probable PTSD” group in our study; other patients with 0-3 points in DRPST were categorized to “nonprobable PTSD” group. Coefficients in bold are significant at  $p < 0.05$  (bootstrapped 95% CIs, 1,000 repetitions) in simple and multiple linear regression (method: Enter) analyses.

DRPST-MDEs, major depressive episodes scale of disaster-related psychological screening test, PTSD, posttraumatic stress disorder; PSQI, Pittsburgh Sleep Quality Index;  $\beta$ , standardized coefficients

In this study, the prevalence of probable PTSD among outpatients with psychiatric disorders and their family was 15.9%, which is comparable with previous study focused on the prevalence of PTSD in the general population (7%–15.8%) [24-26]. Female has been reported to be an independent risk factor for chronic PTSD in severe acute respiratory syndrome (SARS) survivors [27]. In our study, female was significantly associated with higher severity of PTSD symptoms in nonprobable PTSD group (Table 1) but not an independent predictor when considering other factors consequently (Table 2). Females exhibit unique neurobiological response to stressors and have higher risk of PTSD than males [28, 29]. Females have negative views of health, express emotions stronger, and report more psychological problems compared to males [30]. One of the reasons that female was failed to show significance in multiple regress analyses (Table 3) was the confounding effect of tobacco use. Tobacco use is more prevalent in males than that in females in Taiwan [31]. Increased use of substances, including tobacco, marijuana, and alcohol, after disasters have been mentioned in previous studies [32-36]. The self-medication hypothesis [37] and social cognitive theory [38] are proposed to explain postdisaster substance use and mental health problems. Individuals have decreased perceived coping self-efficacy, increased psychological distress, and subsequently increased self-medication by substances after exposing to disaster [39]. In our study (Table 3), individuals with tobacco use had significantly lower severity of PTSD than

those without in the nonprobable PTSD group ( $p < 0.05$ ) but not an independent predictor when considering other factors consequently.

Our study showed that individuals with activities were correlated with developing PTSD than those without. Multiple activities were suspended with government directives for social distancing and isolation during the COVID-19 pandemic for infection control. Loneliness, feeling cut off from social groups, may lead one to feel vulnerable and pessimistic, as well as dysphoric mood and anxiety [40]. A study focusing on young adults during the COVID-19 pandemic in America found that loneliness has been associated with depression, anxiety, and PTSD symptoms [41]. Suspension of activities may have persisted till the remission of COVID-19, which may be long; people who lack of social support and loneliness could get comfort via virtual contact. Individual who has to be isolation during this pandemic should take loneliness into consideration for PTSD prevention or early detection.

We found that chronic physical illness was an independent predictor of PTSD in the probable PTSD group that is compatible with a previous study with regard to SARS [27]. People with chronic diseases, including diabetes, hypertension, and coronary heart disease, are anxious and stressful toward the coronavirus infection due to compromised immunity and a higher risk of mortality [42-45]. Chronic physical illnesses have been postulated to affect individuals' self-efficacy and

therefore weaken their ability to recover from PTSD [46]. In addition, individuals with chronic physical illness may reduce visiting hospital for infection concern and therefore worsen physical condition during this COVID-19 pandemic.

The stressor was a predictor of significantly more severe trauma-related symptoms in the nonprobable PTSD group in our study (Table 3). The COVID-19 outbreak negatively affects service-oriented economies, and countries highly dependent on foreign trade are more negatively affected [47]. The economic crisis can negatively affect ones' mental health [48]. Conservation of resources theory postulated that stress can be caused from perceived loss or potential loss [49]. Stressors in pandemic interact in loss spirals, cascading stressors and therefore induce psychological distress [50]. In a biodisaster like COVID-19, the economic impact may not only severe and also last long. Stimulus vouchers, aimed at spurring consumption in Taiwan, highlighting government efforts to boost economic activity in the post-pandemic new life.

We found that individuals with higher level of sleep disturbance were correlated with higher level of trauma-related symptoms but failure to show significance when considering other factors consequently in our study. Sleep disturbance was a criterion of major depressive episodes and PTSD in the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [51]. A previous study in Taiwan using online survey found that 55.8% of the participants report sleep disturbance in the previous week during COVID-19 pandemic [5]. Previous studies on PTSD have revealed sleep complaints [52]. Insomnia has also predicted other symptoms of PTSD in a group of war veterans 3 months later [52]. Disruptions in total sleep time and sleep efficiency are the specific subtypes of insomnia associated with PTSD [53]. The relationship between trauma and sleep has been postulated that trauma may disrupt the normal sleep-wake regulatory mechanism by sensitizing the central arousal centers, leading to pronounced central and physiological hyperarousal [54].

We found that only one person (4.3%) had panic symptoms in all participants, and panic symptom was a significant predictor ( $p < 0.01$ ) of developing probable PTSD (Table 2). Panic disorder has been explained by alterations of central arousal system and respiratory hypersensitivity [55, 56]. Patients with panic disorder showed delayed vocal responses when processing disorder-specific threat stimuli at strategic stages of information processing, while those with PTSD showed a generalized valence effect at strategic stages of information processing, evincing delayed vocal responses to all stimuli with negative valence [57]. Furthermore, PTSD patients with comorbid panic disorder suffer higher proportions of insomnia, nightmares, and startle responses than those without [58]. Furthermore, panic disorder may evolve after or represent complications of PTSD which increase the severity and treatment difficulties.

Religious believes [59, 60], hopefulness [61], and previous trauma [62] have been reported to be associated with PTSD in previous studies. But we did not show significant differences

between groups either in simple regression analyses or multiple regression analyses in our study (Tables 2 and 3). Hope, promotes recovery from illness and contributes to physical and emotional health [63], has been found to improve one's coping methods during stressful situations and then move forward [64]. However, hopefulness was only associated with developing probable PTSD in simple linear regression but failure to show significance when considering other factors consequently. The cause could be that hopefulness is a criterion of major depressive episodes and PTSD in *DSM-5* [51].

### Study limitations

The readers are cautioned not to overinterpret the study results because our study has seven limitations.

- The study data were exclusively self-reported and may have shared method variance.
- Small sample size was another limitation. We used logistic and multiple linear regression analyses with 1,000 bootstrap samples to verify the results, according a previous study suggestion [22].
- The participants in this study were outpatients and their family in a psychiatric hospital who responded to the recruitment advertisement. We did not separate caregivers from patients in our study.
- We did not ascertain the patients' diagnoses in this study. Different psychiatric disorders may have different psychological responses to disaster.
- We did not assess disease severity, cognitive function, and medical adherence. All those items may also confound the scoring of questionnaire.
- The cross-sectional research design limited our ability to draw conclusions regarding the causal relationship among predictors and PTSD. Further research with longitudinal follow-up study design can be helpful to understand the causal relationship between these predictors and PTSD.
- We did not evaluate the quantity, type of substance, as well as changes before and after the COVID-19.

### Summary

This study identified more activity, panic symptoms, and more chronic physical illness as predictors either in developing probable PTSD or the severity. Therefore, the early screening of predictive factors of probable PTSD during the COVID-19 pandemic and timely interventions will be beneficial for patients with mental disorders.

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## Conflicts of Interest

The authors declare no potential conflicts of interest in publishing this report.

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